Space Weather Forecast

Issued on Saturday, 19 November 2022 at 12:43 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of G1/Minor Geomagnetic Storms peaking later in the UTC weekend.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been at low levels over the past 24 hours, with occasional common-class X-ray flares observed. The main source of the larger flares and the peak event at 19/0623UTC was a sunspot region in the northwestern quarter of the Sun that underwent rapid growth in the period, although its growth phase gave way to spreading to end the UTC morning. This was one of four sunspot regions on the facing side at present, with the other three all in the eastern solar hemisphere.

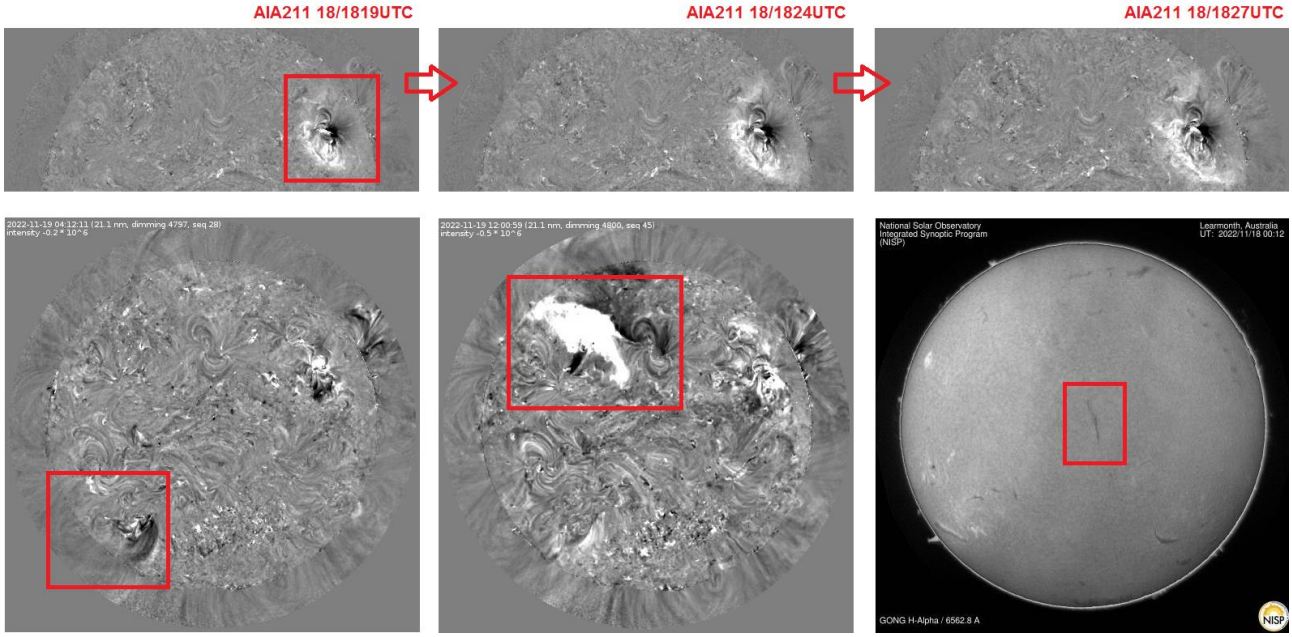

Figure 1: Potential CME-producing events of note in the past 24 hours (clockwise from top left): extreme UV imagery of wave-like ripple emanating from a common class flare from the most active sunspot at 19/0623UTC; A 'disappearing filament' (probably re-absorbed) from near centre-disc on near-infrared imagery; a northeast 'filament eruption' 19/0700-1000UTC; a small possible CME seen following a small common-class flare from the southeast after 19/0200UTC. Further imagery is awaited to confirm and analyse following these events.

There were a few potential Coronal Mass Ejection (CME) progenitors seen on the front side in the period, however at the time of writing there is no evidence of any in available satellite imagery. Firstly, a 'filament' (arc of plasma) near the centre-west of the Sun was seen to gradually fade in near-infra red imagery in the 24 hours, however there was no obvious lift-off. The peak X-ray flare

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of the period showed a ripple-like wave spreading across the Sun in some extreme UV imagery, however this does not appear to have translated to any interplanetary CME element. A smaller X-ray flare from the southeastern sunspot on the facing side at around 19/0200UTC showed possible ejecta in some extreme UV channels, while others showed a large filament detach from the northeast between 19/0700-1000UTC. All these events are being monitored.

Current satellite imagery suggests a possible far-sided southwest-directed CME and perhaps now also faint northeastward and westward emissions, all pending analysis, however at present, no conclusively Earth-directed CMEs have been observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind showed three main phases during the period. Firstly a possible weak CME influence ongoing since 18/0845UTC, which gave way to an increased magnitude feature from 18/1630UTC with varying magnetic field orientation, and finally a discontinuity at 18/2230UTC left a larger magnitude but steady field as well as an increase solar wind speed, albeit still within normal background. The cause(s) of the above are not entirely clear, however the 14 November CME is believed to form at least part of the signature, with a coronal hole fast wind still perhaps unaccounted for.

The solar wind speed showed a gradual increase which became sharp at 18/2230UTC, although still within typical background figures. The number of particles in the solar wind peaked shortly before the main speed increase, else mainly residing nearer the long-term average. The magnetic field associated with these particles rose in steps to eventually peak at slightly elevated levels. The magnetic field showed an initial anti-aligned bias, reversing to become mainly co-aligned (with Earth's field) as the period went on.

The net effect of the above solar wind measures was for mainly quiet geomagnetic indices, peaking below Minor Storm G1 while the greatest changes occurred and while the magnetic field was primarily anti-aligned.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be mainly low, with further common-class flares likely, and with a slight chance of moderate-class flares. The main risk is from the recently growing sunspot in the northwest.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs that feature in this forecast period.

Initially background winds are expected to become enhanced due to the arrival of fast wind from a coronal hole, although confidence is low on the timing of the arrival. The fore-running shock to this speed increase (a Co-rotating Interaction Region, 'CIR') is likely to arrive later day 1 (Saturday 19 November), with a transition into the fast wind through day 2 (20 November). Fast winds are then likely to persist into the new working week before reducing to end the four-day period.

Initially quiet geomagnetic activity is likely to give way to a Chance of G1, with this peaking on Sunday 20 November with the effects of the coronal hole proper. More reliably quiet activity should begin to be restored to end the forecast period.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

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Met Office Space Weather Forecast

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	40	20	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	15	10	10
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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